

REMARKS

The Office Action dated February 4, 2008, has been received and carefully noted. The above amendments and the following remarks are being submitted as a full and complete response thereto. Claims 1-6 are pending in this application. By this Amendment, claim 1 is amended. Support for the subject matter of the amendment to claim 1 can be found in the Specification at, for example, page 11, lines 16-20. No new matter has been added. Reconsideration of the application is respectfully requested.

Entry of this Amendment is proper under 37 C.F.R. § 1.116 since the amendments: (a) place the application in condition for allowance for the reasons discussed herein; (b) do not raise any new issues requiring further search and/or consideration on the part of the Examiner as the Amendment merely clarifies the claimed features of the invention; (c) satisfy a requirement of form asserted in the previous Office Action; (d) do not present any additional claims without canceling a corresponding number of finally rejected claims; and (e) place the application in better form for appeal, should an appeal be necessary. The Amendment is necessary and was not earlier presented because it is made in response to objections raised in the Final Rejection. Entry of the Amendment is thus respectfully requested.

The Office Action rejects claims 5 and 6 under 35 U.S.C. § 102(b) as being anticipated by Miyoshi et al. (JP 07-018431); claims 1, 3 and 4 under 35 U.S.C. § 103(a) as being obvious over Iacoponi et al. (U.S. Patent No. 6,261,946) in view of Ikeda (JP 63-278252) and Miyoshi; and claim 2 under 35 U.S.C. § 103(a) as being obvious over Iacoponi in view of Ikeda and Miyoshi, and further in view of Mamoru (JP 2000-096223). The rejections are respectfully traversed.

In particular, the above-identified application claims a bias sputtering film forming apparatus that includes an AC power source or a DC power source of variable output against a substrate electrode and a database stored in a control system, wherein the control system sets a cathode voltage to a predetermined value, stores a substrate bias voltage in the database, and controls the output of the power source such that the output is progressively varied by selecting a substrate bias voltage value from the database, as recited in independent claim 5.

Miyoshi teaches a method of improving step-covering properties and of reducing the internal stress of a film by increasing a bias intensity in the initial thin film forming stage and decreasing it in the final thin film forming stage in bias sputtering (Abstract). Miyoshi further teaches that the bias intensity is increased in the initial thin film forming stage to improve the step coverage and is decreased in the final flat thin film forming stage to reduce the internal stress (Constitution). In fact, a closer examination of Miyoshi at, for example, Figure 3, reveals that the controller 8 controls both high frequency power sources 5 and 6 that provide a power output to the target 3 and the substrate electrode 4, respectively. Accordingly, when the bias intensity is applied and increased in both the initial thin film and the final flat thin film forming stages, there is no distinction between the bias voltage applied to the target 3 and the bias voltage applied to the substrate electrode 4 in Miyoshi. Accordingly, both the target 3 and the substrate electrode 4 are not powered independently of each other. As such, Miyoshi fails to disclose or suggest setting a cathode voltage to a predetermined value and progressively varying the substrate bias voltage value, as recited in independent claim 5. Thus, Miyoshi fails to disclose or suggest the features of independent claim 5.

The present application also claims a bias sputtering film forming process for forming a thin film by applying both voltages of a cathode voltage and a substrate bias voltage, wherein a thin film is formed in the state wherein only the cathode voltage is applied, and sputtering film forming is performed while progressively varying only the substrate bias voltage so that the thickness of the thin film formed is substantially uniform, as recited in independent claim 1 as amended.

Iacoponi teaches a method for forming seed layers in a channel or via by applying a high bias to the material of the seed layer during deposition (Abstract). Iacoponi further teaches that the adhesion/barrier layer is deposited using conventional deposition techniques, such as physical vapor deposition, chemical vapor deposition, or a combination thereof (column 5, lines 38-42). However, Iacoponi does not teach applying both a cathode voltage and a substrate bias voltage or that the adhesion/barrier layer is formed in the state where only the cathode voltage is applied. In the section titled "Response to Arguments," the Office Action argues that "the initial barrier film is formed by a process such as physical vapor deposition (*i.e.*, sputter) which necessarily requires a bias applied to the cathode" (page 7, lines 13-15). However, the Office Action does not provide the rationale for which a Iacoponi would only apply a cathode voltage to form the thin film, and Iacoponi fails to disclose or suggest this feature. Furthermore, Iacoponi also fails to disclose or suggest sputtering film being performed while progressively varying only the substrate bias voltage, as recited in independent claim 1 as amended. If the Office Action is correct in indicating that "selection of sputtering would require only cathode voltage application" (Office Action, page 7, lines 15-16), then Iacoponi does not teach that sputtering film forming is

performing while progressively varying only the substrate bias voltage. Furthermore, a closer examination of Iacoponi reveals that there is no teaching anywhere in Iacoponi that only the substrate bias voltage is used to form the sputtering film, as recited in independent claim 1 as amended. For at least these reasons, Iacoponi fails to disclose or suggest the features of independent claim 1. As discussed above, Miyoshi also fails to cure deficiencies in Iacoponi in disclosing or rendering obvious the above-discussed features. Thus, a combination of Iacoponi and Miyoshi fails to arrive at the subject matter of independent claim 1 as amended

Ikeda teaches a method to prevent a semiconductor substrate from being damaged and to form a film by gradually increasing the power of a high-frequency bias during a sputtering process (Abstract).

Mamoru teaches forming aluminum films or aluminum alloy films in the bottom edges and flanks of contact holes to prevent the disconnection or deterioration in the electromigration resistance of metallic wirings (Abstract).

However, neither Ikeda nor Mamoru, alone or in combination, cure the deficiencies in Iacoponi and Miyoshi in failing to disclose or render obvious the features of amended independent claim 1. Accordingly, independent claim 1, as amended, is patentable over Iacoponi, Miyoshi, Ikeda and Mamoru.

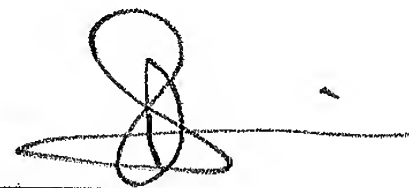
For at least the reasons discussed above, independent claims 1 and 5 are patentable over the applied references, taken alone or in combination. Furthermore, claims 2-4 and 6, at least for their dependence on patentable claims 1 and 5, and for their added limitations, are also patentable over the applied references. Thus, claims 1-

6 are patentable, and withdrawal of the rejections of the claims under 35 U.S.C. § 102(b) and 35 U.S.C. § 103(a) is respectfully requested.

Should the Examiner determine that any further action is necessary to place this application into better form, the Examiner is encouraged to telephone the undersigned representative at the number listed below.

In the event this paper is not considered to be timely filed, the Applicants hereby petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300, referencing Attorney Dkt. No. **029567-00004**.

Respectfully submitted,



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